PYTHON FOR COMPUTATIONAL PROBLEM SOLVING

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Introduction

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- Learn Computational modes of thinking.

- Master the art of computational problem solving.

- Make computers do what you want to do.

Topics

- Control Structures.

- Data Structures, Files.

- Functions.

- Functional Programming.

- OOP.

What does a computer do?

- Fundamentally:

    - Performs Calculations.

    - Remembers results.

What type of calculations a computer can do ?

- Set of Built in oprations. Typically arithmetic,
and simple logic operations.

- Create a new operation.

Can a computer perform / solve any task that exists?

NO !!!!

The task or job can be either :

- Computational.

- Non-Computational.

Computational - The problems that can be solved.

Non Computational - The problem that can not be solved.

Inorder to solve a problem computationally:

- Representation.
- Algorithm.

Representation - captures all the relevant aspects of the problem.

Algorithm:

An algorithm is a sequence of unambiguous instructions for solving a problem, i.e., for obtaining a required output for any legitimate input in a finite amount of time.

The word "algorithm" is derived from the ninth-century Arab mathematician, Al-Khwarizmi.

Man, Cabbage, Goat, Wolf Problem.

A man lives on the east side of a river. He wishes to bring a

cabbage, a goat, and a wolf to a village on the west side of

the river to sell.

However, his boat is only big enough to hold himself, and either the cabbage, goat, or wolf. In addition, the man cannot leave the goat alone with the cabbage because the goat will eat the cabbage, and he cannot leave the wolf alone with the goat because the wolf will eat the goat. How does the man solve his problem?

Solution:

There is a simple algorithmic approach for solving this problem by simply trying all possible combinations of items that may be rowed back and forth across the river.

Trying all possible solutions is referred to as a **brute force approach**.

Example: **Man, Cabbage, Goat, Wolf Problem.**

The computational problem, is to find a way to

convert the representation of the start state of

the problem, when all the object are on the

east side of the river,

man   cabbage goat   wolf

[E, E, E, E]

to the goal state with all objects on the west side of the

river.

Example: **Man, Cabbage, Goat, Wolf Problem.**

Man cabbage   goat   wolf
[W, W, W, W]

with the constraint that certain invalid states should never

be used.

Thus, in a computational problem solving approach, a problem is solved within the representation used, in which the solution within the representation must translate into a solution of the actual problem.

THANK YOU

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